



UNCLASSIFIED

SECURITY CLASSIFICATION OF THIS PAGE

# REPORT DOCUMENTATION PAGE

Form Approved
OMB No. 0704-0188

1a. REPORT SECURITY CLASSIFICATION
Unclassified

1b. RESTRICTIVE MARKINGS

2a. SECURITY CLASSIFICATION AUTHORITY

3 DISTRIBUTION / AVAILABILITY OF REPORT
Approved for public release; distribution unlimited

2b. DECLASSIFICATION / DOWNGRADING SCHEDULE

4. PERFORMING ORGANIZATION REPORT NUMBER(S)

5. MONITORING ORGANIZATION REPORT NUMBER(S)

6a. NAME OF PERFORMING ORGANIZATION
U.S. Army War College

6b. OFFICE SYMBOL (If applicable)

7a. NAME OF MONITORING ORGANIZATION

6c. ADDRESS (City, State, and ZIP Code)
Carlisle Barracks
Root Hall, Bldg 122
Carlisle, PA 17013-5050

7b. ADDRESS (City, State, and ZIP Code)

8a. NAME OF FUNDING / SPONSORING ORGANIZATION

8b. OFFICE SYMBOL (If applicable)

9 PROCUREMENT INSTRUMENT IDENTIFICATION NUMBER

8c. ADDRESS (City, State, and ZIP Code)

10 SOURCE OF FUNDING NUMBERS

| PROGRAM ELEMENT NO. | PROJECT NO. | TASK NO. | WORK UNIT ACCESSION NO. |
|---|---|---|---|
| | | | |

11. TITLE (Include Security Classification)
The 9th Engineer Batalion in Operation Desert Storm (U)

12. PERSONAL AUTHOR(S)
LTC Richard W. Jemiola

| 13a. TYPE OF REPORT | 13b. TIME COVERED | 14. DATE OF REPORT (Year, Month, Day) | 15. PAGE COUNT |
|---|---|---|---|
| Study Project | FROM _____ TO _____ | 93/03/30 | 29 |

16. SUPPLEMENTARY NOTATION

| 17. COSATI CODES | | | 18. SUBJECT TERMS (Continue on reverse if necessary and identify by block number) |
|---|---|---|---|
| FIELD | GROUP | SUB-GROUP | |
| | | | |
| | | | |

19. ABSTRACT (Continue on reverse if necessary and identify by block number)

20. DISTRIBUTION / AVAILABILITY OF ABSTRACT
☒ UNCLASSIFIED/UNLIMITED ☐ SAME AS RPT ☐ DTIC USERS

21. ABSTRACT SECURITY CLASSIFICATION
Unclassified

22a. NAME OF RESPONSIBLE INDIVIDUAL
COL David E. Shaver

22b TELEPHONE (Include Area Code)
(717) 245-4040

22c. OFFICE SYMBOL
AWCI

DD Form 1473, JUN 86 *Previous editions are obsolete.*

SECURITY CLASSIFICATION OF THIS PAGE

UNCLASSIFIED

## ABSTRACT

**AUTHOR**: Richard W. Jemiola

**TITLE** : The 9th Engineer Battalion in Operation Desert Storm

**FORMAT** : Individual Study Project

**DATE** : 22 March 1993 PAGES: 29 CLASSIFICATION: Unclassified

This paper discusses the participation of the 9th Engineer Battalion, 7th Engineer Brigade, VII Corps, during Operation Desert Storm, as viewed by its former Battalion Commander. Stationed in Aschaffenberg, Germany, the unit deployed to Saudi Arabia and initially provided engineer support to the First Armored Division. Later, while under the operational control of the First Brigade , First Infantry Division, it supported the breach into Iraq, participated in the Battle at Norfolk, and conducted denial operations throughout southern Iraq and northern Kuwait. The report highlights lessons in training, materiel, and doctrine. The author concludes that the readiness of the combined arms team to breach Iraqi minefields was inadequate at the onset of war,due to late fielding of countermine equipment, insufficient training time, peacetime training constraints, and voids in countermine doctrine. The author provides information which helps to explain the late fielding of countermine equipment. Finally, he concludes that the future countermine modernization program, key to correcting current shortfalls, must be carefully managed due to future budget reductions.

USAWC MILITARY STUDIES PROGRAM PAPER



# THE 9TH ENGINEER BATTALION IN OPERATION DESERT STORM

AN INDIVIDUAL STUDY PROJECT

by

Lieutenant Colonel Richard W. Jemiola

United States Army

Colonel David E. Shaver
Project Advisor



U.S. Army War College
Carlisle Barracks, Pennsylvania 17013

## ABSTRACT

**AUTHOR**: Richard W. Jemiola

**TITLE** : The 9th Engineer Battalion in Operation Desert Storm

**FORMAT** : Individual Study Project

**DATE :** 22 March 1993 PAGES: 29 CLASSIFICATION: Unclassified

This paper discusses the participation of the 9th Engineer Battalion, 7th Engineer Brigade, VII Corps, during Operation Desert Storm, as viewed by its former Battalion Commander. Stationed in Aschaffenberg, Germany, the unit deployed to Saudi Arabia and initially provided engineer support to the First Armored Division. Later, while under the operational control of the First Brigade , First Infantry Division, it supported the breach into Iraq, participated in the Battle at Norfolk, and conducted denial operations throughout southern Iraq and northern Kuwait. The report highlights lessons in training, materiel, and doctrine. The author concludes that the readiness of the combined arms team to breach Iraqi minefields was inadequate at the onset of war,due to late fielding of countermine equipment, insufficient training time, peacetime training constraints, and voids in countermine doctrine. The author provides information which helps to explain the late fielding of countermine equipment. Finally, he concludes that the future countermine modernization program, key to correcting current shortfalls, must be carefully managed due to future budget reductions.

# THE 9TH ENGINEER BATTALION
# IN
# OPERATION DESERT STORM

## Table of Contents


Chronology ..... I - 1
Map of the Gulf Region ..... I - 2
List of Illustrations ..... I - 3

I. OPERATION DESERT SHIELD

A. INTRODUCTION ..... 1

B. DEPLOYMENT ..... 1
Planning ..... 1
Personnel ..... 3
Equipment ..... 3
Departure ..... 4
C. LIFE AT THE PORT ..... 4
D. LIFE IN THE DESERT ..... 5
Tactical Assembly Area *Thompson* ..... 5
Tactical Assembly Area *Roosevelt* ..... 7

II. OPERATION DESERT STORM
Training for the breach ..... 9
The attack into Iraq ..... 11
Engineer operations ..... 13
Denial operations in Kuwait and Iraq ..... 15
Aftermath ..... 16

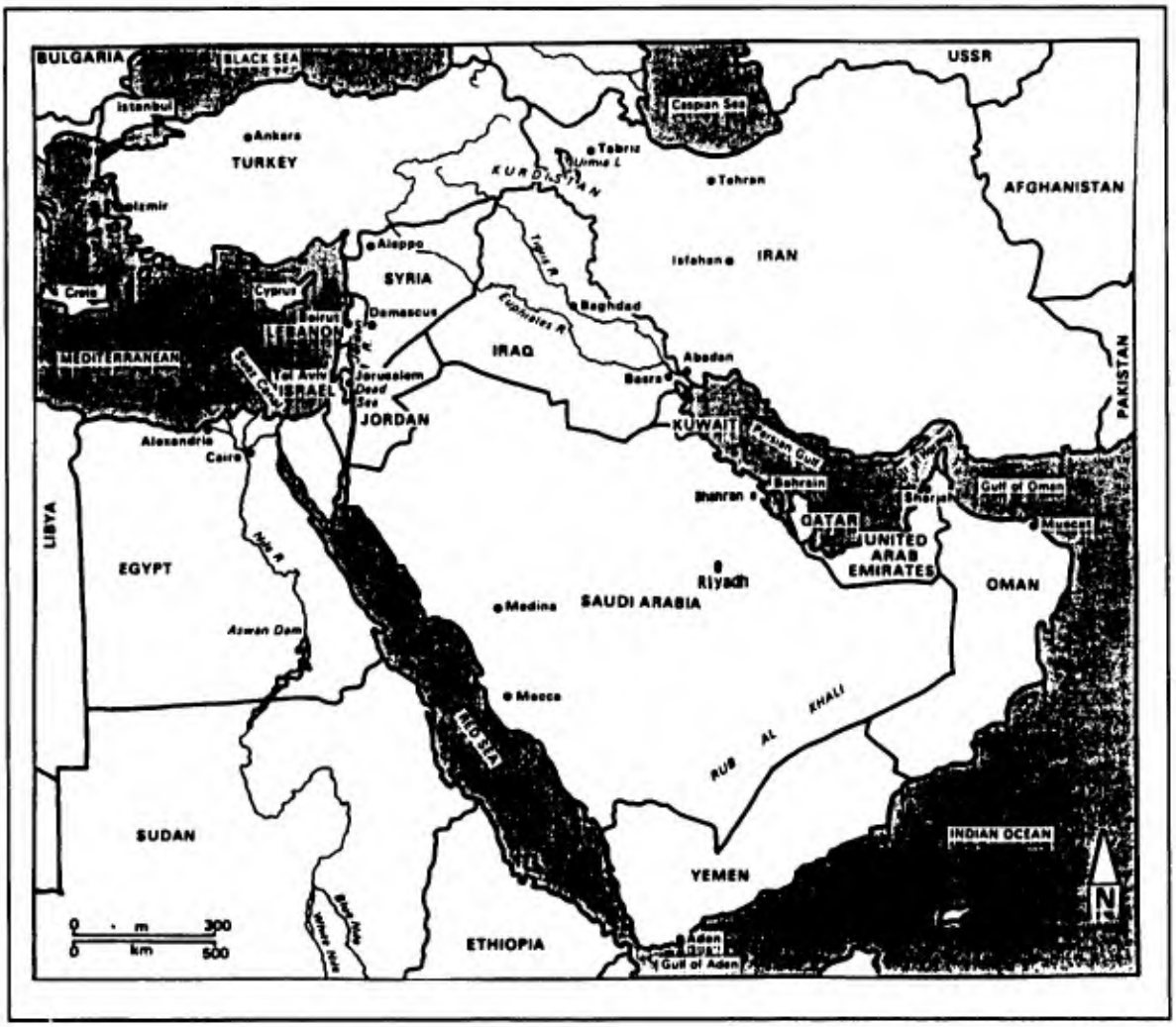
III. LESSONS
Training ..... 17
Equipment ..... 20
Doctrine ..... 26

IV. CONCLUSION ..... 28

# 9TH ENGINEER BATTALION
# GULF WAR CHRONOLOGY

| | |
|---|---|
| Aug 2, 1990 | Iraq invades Kuwait. U.N. demands withdrawal. |
| Nov 8 | 9th Engineer Battalion (EB) ordered to the Gulf. |
| Dec 3 | Advanced Party and C Company depart for Saudi. |
| Dec 5 | Alpha Company departs for Saudi. |
| Dec 7 | HHC and rest of Alpha depart. |
| Dec 9 | B, D, and rest of HHC depart. |
| Dec 11 | Colors unfurled at Port of Dammam. |
| Dec 14-19 | Equipment arrives ( Dammam and Jubayl). |
| Dec 19-21 | Movement from ports to tactical assembly area (TAA)Thompson. |
| Dec 23 | Engineer support to 1AD begins. |
| Dec 25 | Christmas in the desert. |
| Dec 26 | Training for the breach begins. |
| Jan 6, 1991 | Officer training : *Engineers in the Offense.* |
| Jan 11 | OPCON to 1 Bde, 1st Infantry Division. |
| Jan 12 | 9th EB relocates to TAA Roosevelt. |
| Jan 13 | Defend in sector- occupy battle position Sapper. |
| Jan 17 | Operation Desert Storm begins. (air war) |
| Jan 19 | Task organization changes; A/ 1 EB to 9th; A,D/9th to 1 EB. |
| Jan 21 | D/17 EB OPCON to 9th EB. |
| Jan 22 | Breach training intensifies; MICLIC live firing. |
| Feb 2 | Brigade Field Training Exercise. |
| Feb 13 | 9th EB moves to forward assembly area ; B/9 EB cuts border berm. |
| Feb 24 | Start of ground war ; "minefield" breach into Iraq. |
| Feb 25 | Clear friendly ordnance, bunker clearance, equipment destruction |
| Feb 26 | Support attack east towards Kuwait. |
| Feb 27 | Battle of Norfolk ; engineers clear bunkers. |
| Feb 28 | Exploitation into Iraq; cease fire. |
| Feb 29 | Clearing operations- northern Kuwait and southern Iraq. |
| Mar 20 | Return into Iraq. |
| Apr 6 | Return to Saudi. |
| Apr 8 | Assembly area Stuttgart, vicinity KKMC. |
| Apr 18 | Equipment turn-in, King Fahd International Airport. |
| May 4 | Return to Germany. |

# PERSIAN GULF REGION



# LIST OF ILLUSTRATIONS


| | |
|---|---|
| Figure 1 ..... | Projected Iraqi Attack |
| Figure 2 ..... | VII Corps Attack Plan |
| Figure 3 ..... | Pre-battle Iraqi Surrender |
| Figure 4 ..... | Breach Plan |
| Figure 5 ..... | The Battle at Norfolk |
| Figure 6 ..... | 1 ID attack into Kuwait |
| Figure 7 ..... | Roller Mounted on M1 Tank |
| Figure 8 ..... | Plow Mounted on M1 Tank |
| Figure 9 ..... | CLAMS Mounted on M1 Tank |
| Figure 10 ..... | Trailer- mounted towed MICLIC |
| Figure 11 ..... | Mine-clearing Rake attached to CEV |
| Figure 12 ..... | Combat Mobility Vehicle (CMV) |

## Introduction

***After consultation with King Fahd and our allies, I have directed the Secretary of Defense to increase the size of U.S. forces committed to Desert Shield to ensure that the coalition has an adequate offensive military option should that be necessary to achieve our common goals.***

President George Bush
November 8, 1990

The date was November 8, 1990. While attending the Family Forum seminar at the Heidelberg Officers Club in Heidelberg, Germany, I was notified of a phone call. "Hey Sir, this is George--the battalion is going to Saudi." Before I could respond, my Battalion Executive Officer, Major George Hazel, briefed me on the sketchy instructions he had received thus far. "Have the commanders and staff standby-- I'll return in two hours," I replied. This short telephone conversation opened a unique chapter in my life as an Army officer.

What follows is my recollection of events during Operations Desert Shield/ Storm, when I served as Commander, 9th Engineer Battalion, 7th Engineer Brigade, VII Corps. The purpose of this paper is threefold : to record events as I saw them; to identify lessons in countermine operations; and to recommend a future direction for training, materiel development, and formulation of countermine doctrine.

# Deployment

***Planning.....*** for Desert Shield began in August 1990, following Iraq's invasion of Kuwait. LTG Frederick Franks, commander of the U.S. VII Corps, Stuttgart , Germany, recognized that units in the Corps might be called upon to serve in the Persian Gulf. Quickly, he instructed subordinate units to increase personnel training readiness and demanded that supporting agencies respond to unit needs. Several long-standing administrative shortfalls which preclude soldiers from deploying into a war zone were soon resolved. Consequently, VII Corp's

units, including the 9th Engineer Battalion (9EB), were in pretty good shape, administratively, when notified on 8 November 1990 to deploy to the Persian Gulf.

Following notification, deliberate planning intensified. Bits and pieces of information arrived from our higher headquarters, 7th Engineer Brigade, which allowed me to provide *marching orders* to my subordinate companies and complete a concept for deployment. Troop morale was high, but disturbing rumors soon spread amongst the wives. One rumor had soldiers deploying on Thanksgiving Day, while another required all dependents to return immediately to the U.S.. To put such rumors to rest, my Command Sergeant Major (CSM) Edward H. Lugo and I briefed some 550 family members on all available information: we assured them of our commitment to the welfare of both soldiers and families during deployment separation. Helping us to answer the endless number of questions were finance, legal, personnel experts and representatives of other community agencies. The message from the wives and children was loud and clear : "Take care of our husbands and dads, but don't forget about us!" We listened. During the next four weeks we strengthened our in-place family support group and organized a rear detachment, staffing it with the right mix of personalities capable of handling family related issues. One person instrumental to rear detachment operations was my wife, Irene.

Simply put, the mission for the battalion was to prepare and move men and equipment to Saudi Arabia : the equipment would be transported by ship, the men by aircraft. Rolling stock would convoy to the seaport of Rotterdam, the Netherlands, while the remainder would go by railroad.

With little guidance, staff planning started under the watchful eyes of Major Hazel and the Operations Officer (S3), Major Richard Dadisman. We subdivided anticipated deployment and rear detachment activities into functional areas ( personnel, operations, logistics, etc.); estimated the duration of each activity; and produced a timeline to help guide our activities over the next three weeks.

***Personnel*****.....** As of 8 November 1990, the battalion was some 168 personnel short of the required wartime strength ( 778). During the next two weeks *fillers* from the 78th, 237th, and 565th Engineer Battalions arrived from throughout Germany to bring us up to full strength. Mostly volunteers, these soldiers were highly motivated and well-trained. A concerted effort was made to integrate them quickly into the 9th Engineer team Along with the CSM , I personally welcomed each "new" soldier, listened to their concerns, and more importantly, got to know them. Subordinate leaders did the same. This up-front, personalized attention helped to reinforce unit cohesion, often strained at times like this.

During several iterations to process for overseas movement, functional area experts screened soldiers to determine if they met necessary deployment criteria to Saudi Arabia. Doctors determined that from 30 to 40 soldiers were not qualified due to medical reasons. After consulting with the unit physician assistant, I closely scrubbed the list, ending up with a list of only fourteen soldiers. Had the doctor's opinion prevailed, my XO and several other key leaders would not have deployed due to asthma. My decision to deploy them was not challenged. Ironically, the asthmatics reacted *better* in the desert environment than in Germany.

***Equipment*****.....** To fill unit equipment shortages, units previously designated to inactivate were asked to help. Most were happy to transfer the equipment. Major end items like armored personnel carriers (APC), bulldozers, and weapons were obtained easily-- a far cry from normal operations. Additionally, after receiving a " blank check" from VII Corps,we procured scarce repair parts from local dealers for our low density engineer equipment, which later contributed to our sustained equipment readiness rates of above 93%.

After several loading and unloading drills, the equipment was readied for shipment by rail. Movement planners from VII Corps directed us to load some 82 vehicles, mostly tracked and engineer,onto railcars destined for Rotterdam, the Netherlands. Instead, the train departed for Bremerhaven, Germany. So we made some adjustments to the plan. The remaining 220 wheel vehicles road marched to Rotterdam -- a lengthy 400 mile trip. Proud and somewhat surprised, I

watched all vehicles arrive at port with only three vehicles in tow. With the equipment safely in port, we returned to Aschaffenberg and gave the soldiers, many of whom had worked around the clock for two weeks, a much deserved four-day pass. This allowed attached soldiers to return home to visit their families, perhaps for the last time. The next day, after the men had been released , 7th Brigade instructed us to move the first two hundred soldiers to the Frankfurt airport within 36 hours. The engineers, originally scheduled to deploy in mid-December, were moved up in the deployment schedule. Protesting vehemently, I was unable to get the order changed. Unit leaders worked around the clock and managed to gather the men from throughout Germany and prepare them for departure.

***Departure.....*** The battalion began deploying to Saudi Arabia on 3 December 1990 via Civil Reserve Air Fleet (CRAF) aircraft. The advanced party of approximately twenty soldiers joined nearly all of C Company in the first flight from Frankfurt to Dhahran, Saudi Arabia. Alpha company followed on 5 December. Headquarters and headquarters company (HHC) and Bravo departed on 7 December, while the last group, comprised of Delta and the remainder of HHC, left on 9 December. Each 12- hour flight briefly stopped in Rome to refuel and change crews. By 1400 hours on 10 December 1990 the 9th Engineer Battalion had closed on the port of Dammam, Saudi Arabia. We officially unfurled the unit colors at a ceremony the next day, .

## Life At the Port

Each group travelled from the airport to the port of Dammam in school buses driven by Saudi "drivers" who ignored most traffic signs, exceeded most speed limits, and ignored all recommendations to slow down. At the port , home for the next two weeks would be several large warehouses on the east pier. Units arrived daily, and soon each warehouse was filled to its capacity of nearly 1000 soldiers. The port was overflowing with soldiers with little to do. Unit training, consisted of PT, Common Task Testing (CTT), NBC, weapons maintenance, and desert survival and helped to alleviate the boredom. With no laundering facilities, the troops washed

their clothes in the showers and hung them to dry using every contraption imaginable, giving the port the appearance of a Brooklyn ghetto. Caterers hired by the Saudi government provided breakfast and dinner. Generally the food was good, but the unusual tasting meat kept soldiers wondering about its source. Sodas, fresh fruit, and other niceties, also provided by King Fahd, helped ease the transition to the noon meal of Meals, Ready (or not ready) to Eat (MRE).

Tons of ammunition arrived daily; it was stacked within one hundred meters of the troop housing. I was eager for the arrival of our equipment, so we could depart the port that was daily becoming a more lucrative target.

Just when I feared all unit equipment had surely sunk to the bottom of the sea, some of it arrived. On 14 December unit equipment arrived on the ships, *Saudi Riyadh*, *Cape Domingo*, and *Cape Henry*. It was off-loaded and moved to a parking area, where operators received and happily prepared it for the move inland. The next week, we searched aggressively for the remaining unit equipment, eventually finding it scattered on some 14 other ships. To complicate matters, all unit combat vehicles had been diverted to the port of Al Jubayl , 50 miles to the north. Operators and crew chiefs departed for Al Jubayl on 17 December to secure the vehicles and move inland to an assigned assembly area. We were further delayed from departure by the lack of civilian heavy equipment transporters, needed to move the tracked vehicles and engineer equipment. Wheeled vehicles would be driven.

## Life in the Desert

### ***TAA Thompson***

On 19 December the battalion departed the port for Tactical Assembly Area (TAA) Thompson, the assembly area for the 1st Armored Division (1AD), located about 400 miles inland. The next day the Jubayl detachment in the north departed inland. Saudi truck drivers did as they pleased, so we lost control soon after leaving the port. Many of them drag-raced recklessly in their ragged trucks, at times lined up three abreast on the two-lane road. Each contingent refueled

at the VII Corps Convoy Support Center along Tapline Road, the sole road leading northwest from the two ports.

I was awed by the desert. It was flat, vast, and rocky-- with no bratwurst stands, no McDonalds', just *nothing*-- for as far as one could see. We occasionally saw a Bedouin tending his ragged-looking sheep or racing across the open desert in his Nissan pickup truck; otherwise, it was quite barren and empty. This changed with the arrival of 1AD units.

The 9th EB's mission was to support 1AD until arrival of the16th EB. Demands for engineer support were heavy. We prioritized requests, while *sappers*, or combat engineers, worked diligently to accomplish as many tasks as possible. On 22 December, we began digging shower sumps, grease traps, and garbage pits for over 100 units in the TAA, using most of our earth moving equipment. Concurrently we installed perimeter security ditches which prevented vehicles from entering the bivouac from all directions and helped to locate defensive positions. Protective berms, although highly desireable, proved to be too equipment intensive. Therefore we constructed them for the ammunition and fuel storage areas.

As more tracked and wheel vehicles arrived, the roads in the desert became rutted, slowing down wheeled vehicles considerably and causing road grader operators to work around the clock. In addition to improving the road surface, graders produced small windrows of dirt on each side of the road, which aided vehicle operators from straying off at night. Getting lost in the desert is easy, even for the most experienced, particularly during nights with little or no illumination. There simply are no terrain features upon which to orient. A handful of global positioning system (GPS) devices, issued later in mid-January, helped to alleviate the problem.

In addition to equipment intensive tasks , missions requiring engineer expertise began to flow in. 9th EB soldiers emplaced 150 helipads for the 1AD Aviation Brigade, each pad constructed from M-19 airfield matting. Preventive maintenance, checks and services (PMCS) occupied soldiers daily, while the never-ending search for repair parts continued. The equipment's continuous use increased the number of deadlined equipment which caused us to increase our maintenance time to five hours for every 12 hours of equipment operation. Although VII Corps

insisted that peacetime deadline standards still applied, we definitely lowered our standards. These new standards included the bottom line question "Could the equipment function as designed?"

***TAA Roosevelt***

Support to 1AD continued until 11 January 91, when the 9 EB was placed under the operational control (OPCON) of the 1st Infantry Division (1ID), *the Big Red One*, from Fort Riley, Kansas. The battalion relocated to TAA Roosevelt, 1 ID's assembly area , during the second week of the new year, 1991. Moving all essential combat equipment (discounting engineer equipment) and ammunition in a single lift was impossible due to VII Corp's requirement to stock the equivalent of two basic loads-- including 48 tons worth of mine clearing line charges. Our transport capability was clearly inadequate.

The Division Engineer for 1 ID, Colonel Robert Greenwalt, further placed the 9th EB under the operational control (OPCON) of 1st Brigade. Task organizations changed as units arrived during the next ten days, while capabilities of the 9th EB, a Corps battalion, were cross-leveled with the 1st EB, a divisional battalion. D Company, 17th Engineer Battalion, an organic engineer company of the 2nd Armored Division (Forward), was attached to the 9th EB to strengthen its capability to conduct assault breaching operations. In addition, E Company, 1st EB, was attached to 9 EB, which helped to resolve our shortfall in transportion assets. This left both 1 EB and 9 EB with two divisional and two corps engineer companies. Later, I placed an engineer company OPCON to each battalion level task force and relocated the units near their supported battalions to facilitate close working relationships.

I positioned the battalion tactical operations center (TOC) within walking distance of 1st Brigade's TOC, so my operations officer and I could work closely with the leadership of 1st Brigade. The TOC included the S3, the intelligence officer (S2), and a top notch group of NCOs and enlisted soldiers for support. Additionally, an administration-logistics operation center (ALOC), headed up by the XO, was collocated with the Brigade Support Area (BSA).

A summary of the initial and final task organization is shown below:

**Initial Task Organization ( 20 Jan- 24 Feb 91)**

| | | |
|---|---|---|
| A/1 EN | (OPCON) ..... | TF 2-34 Ar |
| C/9 EN | (OPCON)..... | 1-34 Ar |
| B/9 EN | (G S)..... | 1st Bde |
| D/17 EN | (OPCON) ..... | TF 5-16 Inf |

(A/9 + D/9 EN (OPCON) 1 EB)

**Final Task Organization ( 24 Feb-2 Mar 91 )**

| | | |
|---|---|---|
| A/1 EN | (OPCON)..... | TF 2-34 Ar |
| B/9 EN | ( OPCON)..... | TF 5-16 Inf |
| C/9 EN | (OPCON)..... | 1-34 Ar |

(A/9 EN+D/9 EN (OPCON) 1 EB)

The last elements of First Brigade's three maneuver battalions, 1-34 , 2-34 Armor Battalions, and 5-16 Infantry Battalion, closed at the TAA during 10 -15 Jan 91.These units brought new countermine equipment, including twelve tank plows, six tank rollers, and six cleared lane minefield marking sets (CLAMS). Neither I nor the other commanders had previously seen, much less trained with this equipment. Also recently issued were four full-width mine rakes to be mounted on the Combat Engineer Vehicles (CEV), along with seven Armored Combat Earth movers (ACE).

We had never fired a live minefield clearing line charge (MICLIC) due to training range limitations. Further, all countermine equipment, with the exception of hand-held mine detectors, was new to the unit. I certainly had mixed feelings about receiving this late issue of equipment. On the one hand, I was happy to have something besides hand-held mine detectors for breaching minefields. But on the other hand, I resented that it took a war to make that happen.

Training with this new equipment was critical. We had barely started when, on 13 January 91, intelligence reports disclosed that Iraq would possibly attack with four Armored Divisions along

the Wadi Al Batin (a dry valley) in less than 24 hours and attack toward Riyadh. (See Fig. 1)In conjunction with other Brigade units, the 9th EB's mission was to establish a blocking position (*Sapper*) along Tapline Road. The engineers dug in and waited. Fortunately, the attack did not materialize, so we returned to TAA Roosevelt to resume training.

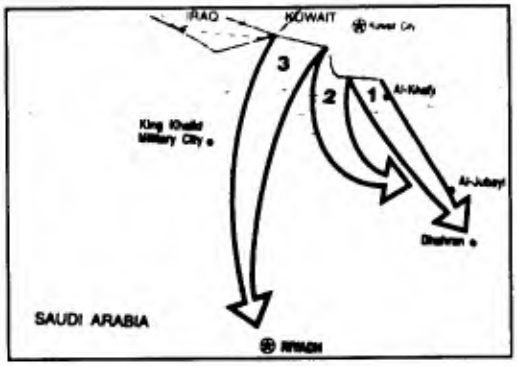



Fig. 1 Projected Iraqi Attack (Jan 91)

## OPERATION DESSERT STORM

The air war started on the morning of 17 Jan 91. Each soldier I observed moved with an even greater sense of purpose. The war with Iraq was now more than a dream- it was reality.

### *Training for the Breach*

The last of the brigade units arrived on the first day of the war. The mission, which would drive all training during the next two weeks, was to attack and destroy an Iraqi Infantry Brigade on the westernmost portion of the Saddam Line. Satellite photos provided the commander with an accurate layout of the enemy units, but they showed no indication of a thick obstacle belt similar to the belt in the eastern sector.

We anticipated that the Iraqis would improve their positions with time and emplace a minefield five hundred meters in front of their defensive positions. We further believed that the minefield would be reinforced with wire obstacles, a minimum of one hundred meters deep, and contain mines on the surface, rather than buried. Surely a more complex system, if emplaced , would be readily detected by VII Corps intelligence, considering the sector had been designated as VII Corp's *main effort*. For training purposes, we constructed the anticipated obstacle and practiced breaching minefields 200 meters deep for good measure. From 18- 31 Jan 91, we

solidified the breaching concept. Leaders trained crews to perform battle drills and synchronized them into larger scale operations, from squad to brigade level. Tank plows would lead the breach, followed by the assault forces. Sappers would then clear each lane using mine rakes. They would mark each cleared lane and mark the approaches to the forward edge of the minefield. The key to the operation was practice, followed by more practice.

1st ID senior leaders approached the breach into Iraq like a river crossing operation; they viewed the breach as critical to the success of the attack. Two brigades were to mass their forces on a two kilometer front, penetrate the defenses, and roll up the flanks to enlarge the breach area.[1] When the *breachhead* was established, the 1st United Kingdom (UK) Armored Division would pass through 1 ID to attack east and destroy the Iraqi 12th Armored Division.[2]

From 20 January 91 - 9 February 91 we rehearsed, test fired our weapon systems, and reconnoitered a overland route west in anticipation of a move west. Engineer equipment began moving forward on 10 February 91 to Logistics Base Echo, located about 100 miles to the west. Three days later, 1st Brigade, including 9 EB, moved west to the forward assembly area (FAA), only ten kilometers south of the Iraqi border.

Meanwhile members of B/9 EB had moved forward on 12 February 91 to begin breaching the border "berm" in support of 1-4 Cavalry Squadron. This "berm" consisted of a four meter wide by one meter deep trench adjoining a four meter high berm that ran the length of the disputed border between Saudi Arabia and Iraq. Using ACEs, the sappers opened ten gaps in the berm, each about 40 meters wide .

At the FAA , final preparations for the assault continued. To defend against a possible attack from the Iraqis, the gaps in the border berm were sealed off using wire obstacles, some locally procured concrete tetrahedrons, and phony minefields. On the evening of 15 February as the men of 3rd Platoon, Bravo Company finished work on the berm, an Iraqi patrol fired on the work party. The sappers and a security force from 3-34 Armor immediately returned fire, causing the enemy patrol to scatter and flee the area. There were no casualties, but the incident highlighted the importance of job site security.

Artillery units began conducting artillery raids across the border firing Dual Purpose Improved Conventional Munitions (DPICM) on the Iraqis. On 17 February, a friendly multiple launch rocket system (MLRS) battery mistakenly fired to the rear. Three rounds of DPICM landed within 100 meters of C/9 EB's assembly area, alarming many of the sappers. Fortunately no one was injured. However, much was to be learned from this incident as the 9th EB was tasked to "clear" the hundreds of duds that lay in the 600 meter by 200 meter area. Support from a explosive ordnance disposal (EOD) team proved critical, since the engineers had no previous training with DPICM.

## *The Attack into Iraq*

***"You may fly over a land forever; you may bomb it, atomize it, pulverize it and wipe it clean of life - but if you desire to defend it, protect it, and keep it for civilization, you must do this on the ground, the way the Roman legions did, by putting your young men in the mud."***

***T. R. Fehrenbach***
***This Kind of War***

The attack started at 0300 hours 24 February 1991 following an extensive artillery bombardment on the objective. 1st Brigade was to attack and destroy the 110th Infantry Brigade, 26th Iraqi Division, which occupied the westernmost position of the Saddam Line. The plan called for 1st ID to take positions five kilometers forward of the enemy on 24 February and attack shortly before daybreak the next day. (See Fig. 2.)

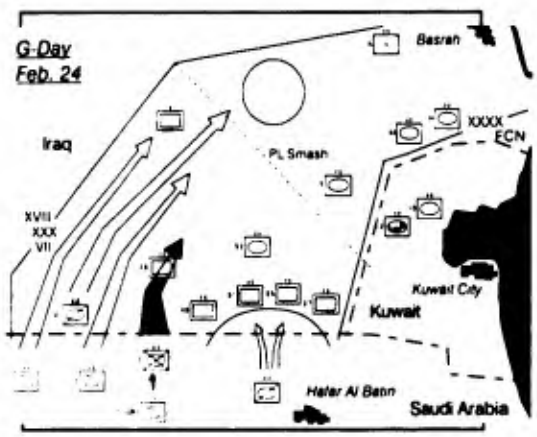



Fig. 2 VII Corps Attack Plan

Iraqi soldiers began walking toward us on the morning of 24 February with their hands in the air. I then directed the commander of B/9 EB to off-load some bulldozers and transport the hundreds of POWs to the rear. (See Fig. 3) One hour later, the Division Commander gave the order to attack.

Fig. 3 Pre-battle Iraqi Surrender

Leading the attack were two balanced task forces, TF 2-34 on the left and TF 5-16 on the right. Each task force, supported by a company of engineers, was to open four one-way lanes (A,B,C,D- E,F,G,H) initially, and an additional "return" lane for each respective task force. Task forces organized into a breach force, assault force and support force; they attacked in that order. Leading the attack were the tank plows assigned to breach each lane followed by another plow or roller to "proof" the mine clearance. Combat Engineer Vehicles (CEV) with attached mine rakes followed the plows and rollers to provide full-width clearance. Below is a sketch of the breach site. ( See Fig. 4 )

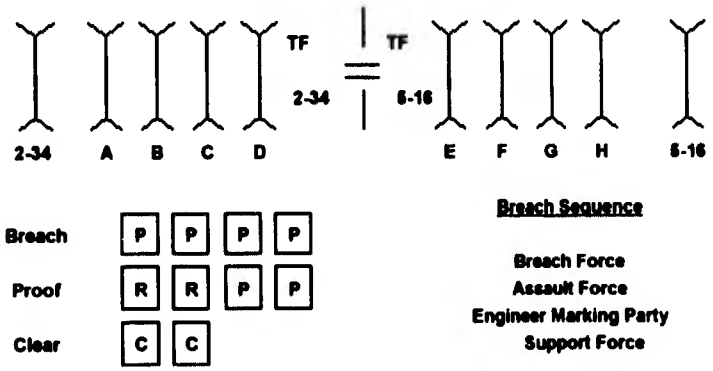



Fig. 4 Breach Plan

## *Engineer Operations*

Overall the breach went quite smoothly. A few anti-tank mines were reported forward of the positions, but the breach zone was empty. Additional mines were reported between the trenches, but they were easily bypassed. Still the men executed everything as they had rehearsed . Moving through Lane Alpha, I noticed enemy mortar rounds striking forty meters in front, one scoring a direct hit on a M88A1 recovery vehicle. Fortunately the vehicle commander was protected by his cupala and suffered only a broken collarbone from the concussion. He was quickly evacuated. The mortar firing stopped as quickly as it had started.

Artillery units passed through the breach lanes, followed by the 1st UK Division. Meanwhile, the brigade advanced forward to expand the breach zone. One MICLIC was fired through a protective minefield located three kilometers northwest of the breach zone. ACE operators busily filled in trenches while M2 Bradleys covered their flanks, a technique tried and proven during training. Engineers continued to clear and destroy bunkers. By dusk we had reached our objective, Phase Line Colorado, about 20 kilometers beyond the front line of defense. The Commander of B/9EB, Captain Scott Bickel, summed it up when he said "This thing is going so smooth it's scary-- no counter battery fire, no tanks, just a bunch of scared, tired, and hungry Iraqi grunts."

By nightfall, the radios buzzed with reports of DPICM minefields. Sappers spent most of the next day burying the duds to prevent further injury. Although soldiers were cautioned not to handle unexploded ordnance, not all soldiers listened. Already, two soldiers from TF 2-34 had died and three had been seriously injured from stepping on or carelessly handling the munitions. TF 5-16 had several casualties as well. The unexploded bomblets, both anti-personnel and anti-tank, littered the battlefield, with a dud rate seemingly higher than the expected 8%.

On 26 February, 1st Brigade was ordered to move east toward Kuwait and attack elements of the 12 Armored Division, a Division of the Republican Guards. The objective area was designated Norfolk. (See Fig. 5) Most of the day, we pushed east toward Norfolk bypassing hundreds of POWs and stopping only to fuel the M1 Tanks.

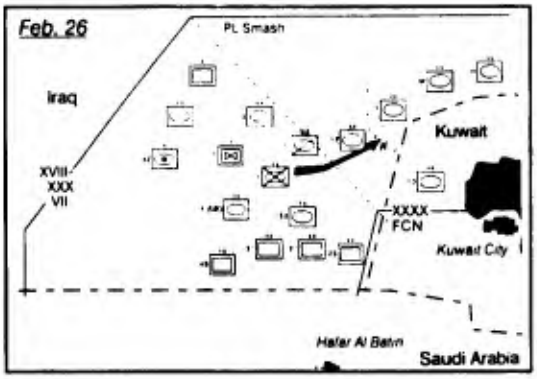



Fig. 5 The Battle of Norfolk

In the evening a battle began to unfold. MLRS fired overhead as we contacted the 2nd Armored Cavalry Regiment and passed through their lines. In the darkness of night the battle ensued.

1st Brigade attacked with TF 2-34 on the right and TF 1-34 on the left, both armored heavy TFs. The superior thermal sights of the M1s allowed them to begin shooting Iraqi tanks at distances of two to three kilometers. Enemy tanks exploded, their orange glow lighting up the battlefield. The tankers had a *field day*, only this was at night. Iraqi tank crews couldn't have known what hit them. Soon the smell of burning hulks filled the air. Fighting continued for several hours and then it was over. The engineers destroyed abandoned equipment, cleared bunkers, and gathered POWs as they followed the armored vehicles. Despite some vehicle damage and some friendly fire incidents, the sappers fortunately sustained no casualties.

On 27 February 1st Brigade pursued the Iraqis to the east as part of a division wedge formation, with 2nd Brigade to our left and 3rd Brigade to our right.[3] Several vehicles in the formation detonated DPICM while leading tanks destroyed several isolated T55 Iraqi tanks at short range. At 1330 hours, after entering Kuwait, the formation ran into an earthen berm about three meters high. As the scouts reconnoitered for a bypass the ACE's cut several gaps, allowing the brigade formation to move once again. Darkness fell and we found ourselves travelling single file down a trail surrounded by high ground on each side. Later determined to be a strip mine, this area would have been a superb ambush site. But the little fight there was in the

Iraqis was gone. President Bush's order to cease fire arrived at 1st Brigade at 0723 hours on 28 February, after only 100 hours of fighting.

*Kuwait is liberated. Iraq's army is defeated. Our military objectives are met... (this) is the time of pride in our troops... And soon we will open wide our arms to welcome back home to America our magnificent fighting forces.*

*President George Bush*
*February 27, 1991*

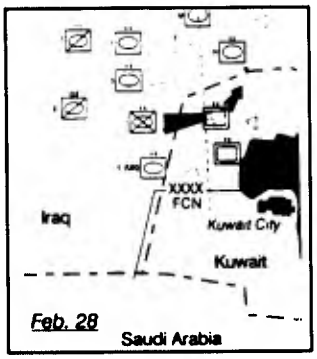



Fig. 6 1 ID into Kuwait

The Brigade kept moving, while sappers stopped periodically to destroy equipment. It advanced west of the Basra-Kuwait City highway in central Kuwait. By evening, 1st Brigade had pushed its way across 260 kilometers of desert to reach the Basra-Kuwait city highway. There we rested for the challenging operation that lay ahead.

## *Denial Operations in Iraq and Kuwait*

The next day we began a new mission -- to destroy enemy equipment in northern Kuwait and southern Iraq and thus to impair Iraq's future ability to wage war. Our first priority was to clear the Basra-Kuwait City highway for a C-130 airstrip . Dead Iraqis lay among the hundreds of destroyed vehicles, apparent victims of the allied air attack. Next we cleared bunkers, trenches, and positions of enemy soldiers unaware of the cease fire came. Then we destroyed enemy equipment and facilities using engineer equipment and demolitions. Engineers were tense, even though Iraqis surfaced from bunkers seemingly pleased that the war was over. Many cried as they were rounded up, given food, and treated with respect -- a far cry from the methods they had used on the Kuwaitis.

Engineers were in *sapper heaven* as they demolished abandoned Iraqi equipment and facilities in southern Iraq and northern Kuwait. I too honed my rusty demolition skills. Although exciting,

denial operations are also dangerous. Leaders continuously stressed demolition safety. Explosions could be heard throughout the day as the engineers combed the desert searching out and destroying Saddam's equipment. In the end the sappers from 9EB had destroyed 245 combat vehicles, 117 air defense artillery pieces, 28 artillery gun-tubes, 303 support vehicles, 473 bunkers, and literally hundreds of tons of munitions. By 20 March 1991, it was time to depart Kuwait and return to Iraq.

## *Aftermath*

1st Infantry Division headed west on 21 March and set up in the open desert of southern Iraq to cover the XVIII Airborne Corp's withdrawal from the north. Two weeks later came the welcome news-- " Return to Saudi ".

On 3 April the battalion main body returned to Saudi and moved to Assembly Area (AA) Stuttgart . C/9 EB's completion of a large recreation complex and grading of fifty miles of roads for 1 ID marked the official end of our support of a superior combat team--1st Brigade, of the ***Big Red One***.

At AA Stuttgart we cleaned and maintained vehicles and equipment. During the next several weeks, the Saudi weather turned increasingly hot -- temperatures often exceeding 100 degrees F. Violent sandstorms blew unexpectedly, at times knocking down tents. The concrete-like soil prevented us from using full length tent stakes and forced us to use jackhammers in order to match the forces of mother nature.

On 19 April the tracks departed via civilian heavy equipment transports (HET), while the wheeled vehicles departed along a southern route destined for King Fahd International Airport (KFIA), 9th EB's final home in Saudi. Several hundred engineers flew by C-130 aircraft from KKMC to KFIA, arriving on 20 April. By 26 April all unit equipment had been washed, reloaded, inspected by Military Police Customs agents, and placed into a *sterile* area to await shipment.

Then the day came that all had been anticipating. From 2-4 May 1991, the men of the 9th Engineer Battalion boarded three separate flights for Germany. Each flight of soldiers was met by

loved ones, who had waited five months for this day to arrive. It was truly a time for celebration and reflection.

## LESSONS

The dictionary defines a lesson as " something to be learned."[4] Much can be learned from our experience in Desert Storm. What follows is a review of lessons in countermine warfare, discussed by the interrelated areas of training, equipment, and doctrine. Each area will be further discussed through observations, discussion, and analysis. Recommendations will be provided. And to help explain the shortcomings in U.S. Army countermine warfare at the start of the Gulf War, we will look retrospectively in the training and equipment areas.

### *I. Training*

***Observation : At the onset of Desert Storm 9th EB was insufficiently prepared to conduct countermine operations. Training had focused too heavily on defensive operations. Countermine training has been and remains unrealistic.***

#### *Discussion and analysis:*

Realistic training is vital to developing an effective fighting force. Likewise, realistic countermine training is essential to developing an effective minefield breaching force. The 9th EB inadequacies did not develop overnight. Since World War II the U.S. Army has placed a low priority on countermine training. A retrospective look may provide some insight.

For the last 40 years, the major threat to U.S. security has been the Warsaw Pact, which organized, trained, and equipped its military forces for offensive operations. Its military strategy was no secret- to overwhelm the adversary with massive formations supported by unrelenting firepower and to attack and stop only when they reached their objective. To counter this , NATO developed a defensive strategy that, over time, oriented leaders to think, organize, train, and equip U.S. ground forces to fight defensively. This strategy of defense against the Soviet

hordes created a defensive mindset in many senior Army leaders of the 1960s and 1970s, many of whom would lead the Army of the 1980s.

In the 1970s at the tactical level, maneuver forces trained for both offensive and defensive operations, but they neglected many tasks associated with offensive operations. Tasks like breaching enemy minefields were given lip service and often simulated or performed unrealistically. Units throughout the Army trained to fight the Soviets on the plains of Europe, while in Europe the General Defense Plan ( GDP ) was the driving force of unit training programs. For engineers,like the 9 EB, this translated to emplacing minefields rather than breaching them. Combined arms training exercises were infrequent or unrealistic. During REFORGER exercises, mobility and countermobility drills became merely contests to determine who could post or remove the most obstacle "certificates" and construction tape -- each simulating an obstacle. Put simply, units did not train as they would be expected to fight.

In the 1980s, AirLand battle, a doctrine which focused on offensive operations, helped to advance U.S. Army war fighting doctrine. Senior military leaders began to restructure the Army and increase its offensive capability. Words like *attack*, *maneuver*, and *breach* became more than buzzwords as the first units rotated through the National Training Center (NTC) in 1982.

Early on, NTC observers judged many units as deficient at performing complex tasks that involved all members of the combined arms team, such as breaching enemy minefields. They also found :

a. **A need for armored units to train more often with engineers and for more engineers to be assigned to armored units.**

b. **A need for a realistic training mine that would simulate casualties.**

c. **A need for modernized assault breaching equipment to detect and neutralize mines.**

As units rotated through the NTC, minefield breaching tactics and drills improved, but none the less remained inadequate. Still lacking was an acceptable means of locating the forward edge

of the minefield. Only two methods existed : bulling through with the leading tanks, which was considered to be unacceptable in war (although often practiced in training); and employing dismounted engineers with mine detectors, which was deemed too slow and hazardous. Modernizing assault breaching equipment, long identified as deficient by engineers in the early 1970s, finally started to get the attention of the maneuver commander in the 1980s.

The need for more engineers at NTC gave birth to the Engineer Restructure Initiative (ERI), formerly called E-Force. This initiative resulted in each maneuver brigade recieving a battalion of engineers. The concept was validated during REFORGER 89 and further validated during Desert Storm. Organizing as you fight makes training as you fight much easier.

***Recommendation:*** At the Combined Training Centers and at U.S. Army installation training areas, training scenerios require balance. They should include both offensive and defensive operations. Realistic countermine training should be incorporated during the offensive phase. Both live mine and countermine training should be allowed. Soldiers responsible for firing the MICLIC during war should fire it during times of peace. The training deficiencies during Desert Storm were a direct result of not training as you are expected to fight.

The Realistic Mine Effects Simulator (MES) , when fielded, will help to provide the desired training realism and tie-in with exercise control systems to accurately record "kills". War games and simulations, which significantly impact decisions relating to training and equiping the future engineer force, must also realistically factor in mine warfare.

## ***II. Equipment***

***Observations: Countermine equipment was grossly inadequate. New equipment was fielded late, leaving insufficient time for training. MICLIC was unreliable. Minerake and the ACE performed well .***

*1. Countermine sets - Discussion and analysis*

Countermine battalion sets include track-width rollers and plows, and a breached lane marking system. Designed to be employed together, each component serves a distinctly different function:

a. ***Roller*** - Rollers mounted on the front of tanks are designed to detect and neutralize mines in order to locate a hidden minefield. Rollers weigh approximately ten tons. They can be mounted in 15-30 minutes,released in less than a minute, and are 90% effective at neutralizing single-impulse, pressure-fuzed mines. (See Fig. 7) However, against the double-impulse mines, common in the Iraqi Army and readily available to other third world countries, they are ineffective.

Although first used during World War II, the mine roller was not developed until the late 1960s and early 1970s, when wars in the Middle East highlighted a need for countermine technology. A mine roller for the M60 tank was "reversed engineered"(copied) from the Soviet PT55/KMT5 and type classified, for limited procurement, in 1979. [5] In 1987, during a review of equipment procurements, the Vice Chief of Staff of the Army wanted to know why the Army was buying rollers for M60 tanks while M1s were rolling off the production line. For over five years the proponents for the tank roller, the engineers, had been unable to convince leaders in the armor community, the user, that the roller should be mounted on the *M1* tank . Conversely, armor leaders were unable to convince engineers that the roller should be mounted on the Combat Engineer Vehicle. This deadlock broke when both parties agreed to mount rollers on existing M1 tanks-- an answer the Vice Chief didn't buy. Indecision among the tankers and engineers was therefore the prime cause for production delays of a much needed capability.

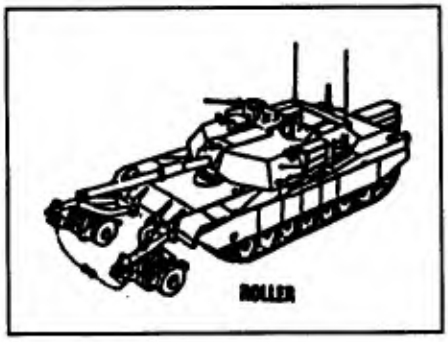



Fig. 7 Roller mounted on M1 Tank

A new kit was needed to mount the old roller to the M1. This was developed and type classified standard in 1988 . Manufacturing began in 1989-- not in the U.S., but in several foreign countries, including Israel.[6] The M1 rollers and mounting kits were finally assembled, shipped

from Israel to Saudi Arabia, and issued to units, including 1st Brigade, 1 ID in December 1990, some ten years after type classification of the M60 version. Speed and maneuverability had taken precedence over minefield detection.

Initially during Operation Desert Shield, the tankers of 1st Brigade were pleased with the roller. But soon they preferred the plow over the roller for these reasons:

a. Rollers bogged down in the soft sand, inhibiting tank mobility.
b. Iraqi mines were expected to be surface-laid, largely negating the need for a subsurface detection system.
c. Roller's were ineffective against double-impulse mines.

**b. *Plow*** - The other half of the battalion countermine set, the track-width tank plow, also mounts on the front of a tank. Unlike rollers, the plow is designed to lift and remove mines to a safe area, rather than detonate them. Plows are used after the minefield is located. Raised and lowered from inside the tank, the plow permits greater mobility when not engaged. ( See Fig. 8)

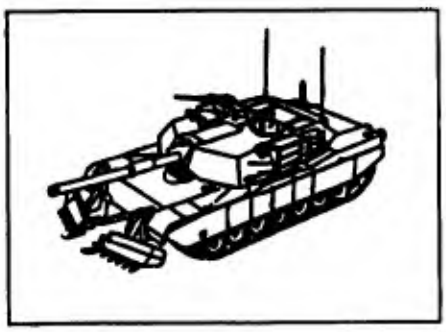


Fig. 8 Plow mounted on M1 Tank

As with the roller, technology for the tank plow dates back to World War II . Following type classification of the tank plow in 1975, the Commandant of the Armor school decided not to field it.[7] The proponent for the tank plow, the Engineer school, provided designs to the British and Israeli Armies, who had repeatedly expressed interest . The Israelis improved our design and quickly fielded the tank plow.

While visiting Israel in 1983, leaders from the Armor school observed a breach demonstration and were amazed by the performance of the tank plow. They decided they wanted it- virtually the same plow designed in the U.S. some eight years before.[8] As with the roller, the tank plow was fielded just weeks before the ground assault into Iraq.

*c. Cleared Lane Marking System (CLAMS)* - CLAMS, the third component of the countermine set, is designed to mark a breached lane. It consists of a dispenser filled with 150 chem light markers and mounts to the back of the M1. (See Fig. 9) As the plow or roller breaches forward, the CLAMS mechanically sets candle-like markers in the center of the breach lane. During Desert Storm, this system was tested during a training exercise. We soon discovered vehicles following the breach vehicle would consistently belly- crush the CLAMS markers causing one soldier to remark, " Chalk-up another one for technology". CLAMS remained mounted on the M1s and were not used during the War.

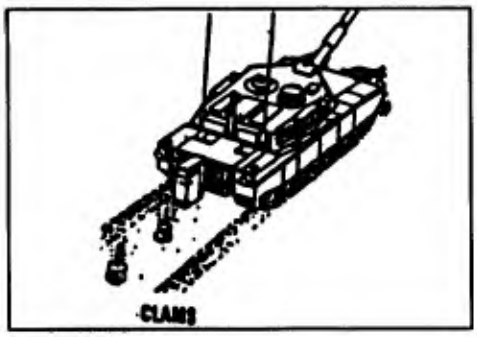



Fig. 9 CLAMS on M1 Tank

*2. Mine Clearing Line Charge (MICLIC)* - The mine clearing line charge is a trailer-mounted, coiled line of explosives designed to project into a minefield, detonate, and "clear" a lane for tanks and other vehicles. (See Fig. 10) When a minefield is encountered, the MICLIC is pulled forward to within 50 meters of the forward edge of the minefield. The rocket is then fired over the towing vehicle to deploy the charge and detonated to destroy mines along its path. The deeper the minefield, the more MICLICs required to breach it. During testing at the National Training Center in 1990-1991, the MICLIC failed to adequately detonate all mines within a specified distance from the charge, particularly the newer *blast- hardened* mine. This left doubt about its efficiency in the minds of engineers and tankers alike.[9] This doubt turned to despair during the Gulf War.

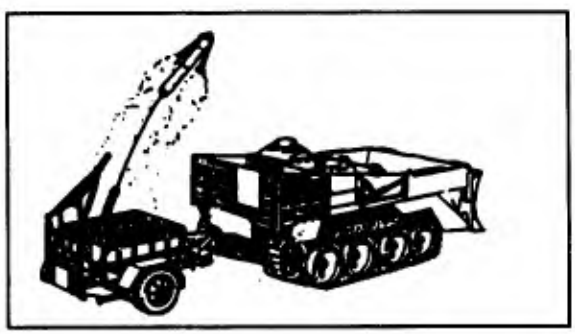


Fig. 10 Trailer-mounted towed MICLIC

During training, the 9th EB experienced only 50% reliability after firing some twenty-four MICLICs. Other combat engineers in the theater experienced similar results.[10]
Roughly one half of all failures resulted from equipment malfunction, including poor design. Most failures were a result of the arresting cable not arming the line charge. Also, several rockets with excessive thrust literally ripped the line charge from the container, thus severing the firing circuit. The remaining failures were attributable to flaws in the firing circuit or to crew error.

To improve "system" reliability and mobility , the Division Engineer directed mounting two MICLICs on the M60 chasis of the armored vehicle launched bridge (AVLB) creating the armored vehicle launched MICLIC, or AVLM. This arrangement proved to be only slightly better than the trailer- mounted version, because the M 60 chassis was prone to break down. Increased probability of at least one of the MICLICs working seemed its only advantage. Contrary to those who believed the system to be more survivable, I believe it is a less survivable system. The AVLM often lumbered on the battlefield like a Brontisauras from the past, with two, rather than one, MICLICs exposed to direct and indirect fire. Today ,the AVLM, in the eyes of many task force commanders who observed it during Desert Storm, is a joke.

The U.S. Army version of the MICLIC was adopted from the Marine Corp's M58A1 line charge, developed in the 1970s. After limited operational tests, it was type classified standard in 1985 and fielded in 1987.[11] However, most Army and Marine Corps installations prohibited live firing of MICLICs because it's explosives exceeded the allowable limits. This led to the development of a training MICLIC, whose inert charge still required a live rocket to project the charge. Due to its high cost, only two rockets were allocated annually to each engineer battalion. Hence, virtually all of the assigned crews were unqualified.[12] Although many units noted this in monthly readiness reports, little was done to resolve the issue.

*3.* ***Mine Clearing Rake*** - The mine clearing rake, or mine rake, is a full-width mine-clearing attachment for the Combat Engineer Vehicle (CEV), or an M60 tank with a blade. (See Fig. i i) The requirement for a mine rake was identified by the U.S. Army Engineer school in September 1990 following Iraq's invasion of Kuwait. CNN described the Iraqi defenses as

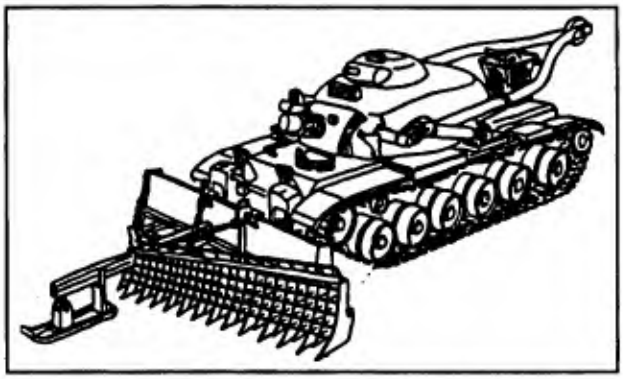


Fig.11 Mine-clearing Rake attached to CEV

impenetrable, energizing the materiel developers to seek quick solutions. Assigned the mission in November 1990, the Belvoir Research, Development and Engineering Center, Ft. Belvoir, Virginia, designed a rake that sifts loose soil for mines. This simple, easily attached device weighs only 2 tons.[13] The center developed drawings and fabricated two prototypes in house. After initial field tests, production began on 5 December 1990 at Letterkenny Army Depot, Pennsylvania. Advanced testing continued during production until January 1991, when Letterkenny shipped some 60 units to Southwest Asia. The First Infantry Division (Mechanized) was assigned the breaching mission and received their complement of six rakes on 9 January 1991. Even though the mine rake is a relatively simple item of equipment it was amazing that the entire RDA cycle, from concept to fielding, took only four months.

**4. M9 Armored Combat Earthmover (ACE).** The ACE, an air transportable, armored, amphibious tractor used primarily for dozing and grading, performed exceptionally well during Desert Storm. As a last resort, the ACE can also be employed in a countermine role. From breaking down berms in Iraq and Kuwait to pushing hulks off the Basrah-Kuwait City highway, the ACE proved to be reliable and capable, easily keeping pace with the M1s and M2s.

As mentioned previously, the ACE was used to clear trenches by simply filling them in, while M2s provided flank security. This proved to be a much safer method than the alternative of dismounted infantry having to physically enter the trench.

First conceived as the Ballastable Airborne Tractor ( BAT ) in 1956, the developmental trace of the ACE is far too lengthy, complicated, and tragic to discuss here.[14] Like much of the other

engineer equipment, it was fielded after Iraq's invasion of Kuwait. The time frame for its development says it all.

***Recommendations :*** Mine technology, increasingly sophisticated and effective, continues to out-pace countermine technology. The gap must be closed . The current Army Countermine Modernization Plan is, for the most part, on course. Future development of countermine equipment should be directed toward :

**1. Detection**

**a. Standoff** : The standoff mine detection system (STAMIDS) will provide a much needed capability with wide application in a desert environment.

**b. Close-in** : Current detector cannot detect nonmetallic mines very well. Replacement with the AN-PSS 12 mine detector should continue. Commercial close-in detectors technology is improving and deserves close watch.

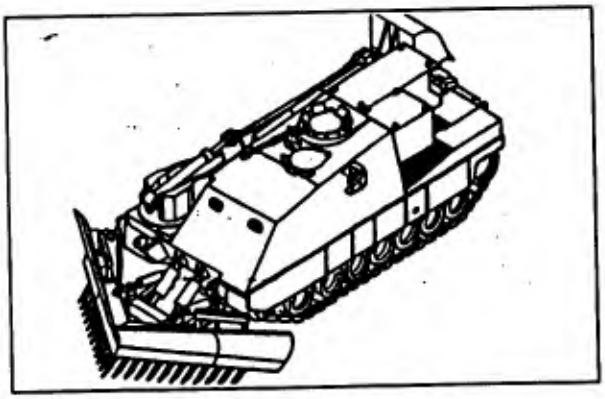


Figure 12 Combat Mobility Vehicle (CMV)

**2. Breaching** :

**a**. A Combat Mobility Vehicle (CMV) or M1 breacher is desperately needed, but not both. Developing systems with identical capabilities, such as the CMV and the M1 breacher, appear wasteful to members of Congress, especially during these times of dwindling defense budgets. However, it is very important that we continue to develop a modern mechanical breacher.

**b**. Production of MICLIC and development of the Improved Dispersed Explosives (IDX) line charge is an unnecessary expenditure of funds. Propelled line charge technology is old and unreliable. Future production of the MICLIC is scheduled. This should be terminated until all MICLICs in stock are modified to eliminate design failures. In the interim, existing stocks should provide sufficient breaching assets. The MICLIC training dilemma should be resolved as the new, improved low cost trainer is fielded this fiscal year.

**c.** Bimodal dispersed explosives designed to neutralize large areas seem promising.

**d.** The most promising of all emerging technologies seems to be the high powered microwave breaching system. This easily transportable system is a fully self-contained, light-weight system that attaches to a breaching vehicle ( CMV ) and directs high energy microwaves to neutralize mines. Unfortunately, funding of this program in the out-years appears unlikely.

## *III. Doctrine*

***Observation : Draft assault breach doctrine fielded shortly before Desert Storm provided a sound foundation. Doctrinal voids existed in the areas of breaching unexploded ordnance (DPICM), assault breach marking procedures, and threat mine recognition .***

***Discussion and analysis:*** Warfare is becoming increasingly complex, as new and sophisticated weapon systems are fielded. One such system is the MLRS, which during the Gulf War delivered a new type of munition, DPICM. Vast amounts of DPICM were delivered on the enemy positions prior to the attack of 24 February 1991. As friendly units reached their objective, the unexploded, highly sensitized bomblets, about the size of a hand grenade, damaged equipment, and killed or maimed unsuspecting American soldiers. One round of DPICM, exploding above the ground delivers sufficient bomblets to cover an area the size of two football fields. Small white ribbons act as parachutes to help guide the bomblet to the ground where, they are supposed to explode on contact. During 25 February 1991, I observed hundreds of unexploded bomblets at one site alone.

Manuals on DPICM, found only in the MLRS units, were technical in nature and failed to mention procedures , techniques, or equipment needed to neutralize the munition. These must be developed and integrated into the Army's countermine doctrinal publications, immediately.

Minefield marking doctrine was limited to a National Training Center (NTC) video tape provided to units in the desert by the Engineer School. They recommended CLAMS for lane marking, but CLAMS didn't work. For entrance marking they recommended plywood panels, but failed to discuss specifics: panel supports, best color for maximum visibility during sunlight, marking designation -- alphabetic or numeric, approach marking (day and night), and other relevant details. In the desert, leaders worked out these details by trial and error but wasted valuable resources in the process. A proven marking doctrine would have saved valuable time.

Technical information on the high technology mines in the Iraqi inventory was not initially available. But by late December, we received a copy of the *Mine Recognition and Warfare Handbook*, published by the Engineer School with the assistance of the Foreign and Science Technology Center. The book described how Iraqis employ mines, how we should neutralize them, and contained color photos of 97 different mines in the Iraqi inventory.[15] However, the instructor from the Mobile Training Team stated that many of the Iraqi mines were not breachable with U.S. countermine equipment. Good news like that we didn't need.

***Recommendation:***

Incorporate procedures for marking and clearing DPICM into countermine literature. The Engineer School should work closely with developers of artillery and Air Force ordnance and develop clearance doctrine before new ordnance is fielded. Aspects of prediction, identification, marking reporting, and neutralization should be addressed. When developed, it should be integrated into the countermine training curriculums of professional schools within Training and Doctrine Command (TRADOC).

Minefield marking doctrine is currently being revamped. However, it must be validated at the NTC and should be a joint U.S. Marine, U.S. Army effort.

# Conclusion

During a VII Corps Commander's briefing of 18 December 1990, then Lieutenant General Franks, Commander of the U.S. Seventh Corps , highlighted two principle concerns: the Iraqi artillery and the Iraqi minefields. Specifically, he questioned our ability to breach minefields. His concern, I believe, was both personal and professional. Having lost his leg in Vietnam to a land mine, General Franks was personally aware of the horrors of land mine warfare. He was also an Armor officer, fully aware, I believe, of our training and equipment shortfalls in the countermine arena.

Prior to the breach, the strongest supporters of new countermine equipment were members of the armored community. Following the breach, as many discovered the mine threat was over-estimated, support waned. The serious attitude displayed by maneuver commanders in December 1990 when the minefield threat was real must not be allowed to fade with the memories of Desert Storm. We must not get complacent over a victory against an enemy lacking the will to fight. This operation simply was not a rigorous test of the combined arms team's ability to breach complex obstacle systems.

The record of countermine equipment development has not been good. Equipment whose proponent (engineer) differs from the "customer" (armor), as in the case of the countermine set ( rollers and plows), appears to be particularly susceptible to delays. Bureaucratic vacillation caused by changes in leadership, priorities, and requirements from both branches have contributed to significant delays in equipment development, production, and fielding. To improve our countermine capability in the future, greater cooperation will be needed between the Armor and Engineer branches.

The Gulf War highlighted the need to modernize U.S. Army countermine equipment, a lesson recognized by the Department of Defense. In the current Defense Planning Guidance, countermine equipment is listed as a high priority area of investment:

(U) Mine Warfare: improved ....land mine clearance ability ( including rapid minefield location and improved killing mechanisms, including against scatterable mines),.... also, assault obstacle-breaching capabilities and advanced force-multiplying offensive land....capabilities.[16]

However, countermine equipment will compete against other needed systems, and competition will be fierce for scarce resources. Any funds allocated toward improving our countermine capability must be wisely and prudently managed.

## Endnotes

[1] Gregory Fontenot, Lieutenant Colonel. " The Dreadnoughts Rip the Saddam Line," Army January 1992 : p31.

[2]Ibid, 30.

[3] Lon E. Maggert, Colonel. " A Leap of Faith" Armor, Jan.-Feb.1992, p.29.

[4] Websters Dictionary, New Twentieth Century Unabridged, p. 1038.

[5]Telephone Conversation with Mr. Michael Pilloch, Countermine Systems Directorate, U.S. Army Belvoir Research, Development and Engineering Center, 30 October, 1992.

[6]Ibid.

[7] Ibid.

[8] Ibid.

[9] Ibid.

[10]Vernon Lowery, " Initial Observations by Engineers in the Gulf War," Engineer October 1991: p.45.

[11]Russell L. Fuhrman, Lieutenant Colonel. " Countermine for the AirLand Battle," Engineer #1,1983:p 24.

[12]Lowery, p. 45.

[13]James M. Dillon , "Mine Clearing Rake" , Belvoir Research, Development and Engineering Center, Ft. Belvoir, Va. Pamphlet, 1991, p.2.

[14] Historical Summary, MOCOM, Vol I, p.41, and 43-44.

[15] Donald Constantine, Captain. " Sappers Forward", Military Review , March 1992, p 25.

[16] Secretary of Defense Dick Cheney," Defense Planning Guidance" FY 1994-1999 ( Secret),DOD, p 44.

# Bibliography


1. Cheney, Dick , Secretary of Defense," Defense Planning Guidance" FY 1994 -1999 ( Secret), Department of Defense, p. 44.

2. Constantine, Donald, Captain. " Sappers Forward", Military Review , March 1992, p 25.

3. Dillon , James M. "Mine Clearing Rake" , Belvoir Research, Development and Engineering Center, Ft. Belvoir, Va. Pamphlet, 1991, p.2.

4. Fontenot, Gregory, Lieutenant Colonel. " The Dreadnoughts Rip the Saddam Line," Army January 1992 : p31.

5. Fuhrman, Russell L., Lieutenant Colonel. " Countermine for the AirLand Battle," Engineer #1,1983:p 24.

6. Lowery, Vernon. " Initial Observations by Engineers in the Gulf War," Engineer" October 1991: p.45.

7. Maggert, Lon E., Colonel. " A Leap of Faith" Armor, Jan.-Feb.1992, p.29.

8. Pilloch, Michael. Telephone interview with representative from the Countermine Systems Directorate, U.S. Army Belvoir Research, Development and Engineering Center, 30 October, 1992.